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-- In accordance with the embodiments of the present invention described hereinbefore, a clean gas is efficiently supplied to the surface, or adjacent thereto, of the surface of an optical element isolated from a surrounding ambience, which surface faces the surrounding ambience. This assures that the surface of the optical element is kept clean, and adhesion of the depositions can be prevented effectively. Thus, contamination prevention, which is particularly suitably applicable to a semiconductor exposure apparatus, is accomplished. --

IN THE CLAIMS:

Please CANCEL claims 1-44 without prejudice to or disclaimer of the recited subject matter.

Please ADD new claims 45-76 as follows. Note that all claims currently pending have been reproduced below.

proposed 9/18/83

~~1/45. An exposure apparatus for illuminating a pattern with light from a light source and for exposing a predetermined surface with light from the pattern, said apparatus comprising:~~

~~a projection optical system for projecting the pattern onto the predetermined surface, said projection optical system having at least one optical element having optical surfaces; and~~

~~gas supplying means for locally supplying a gas to said at least one optical element, wherein said gas supplying means directly blows the gas toward one of the optical~~

surfaces of said at least one optical element, which is closest to the predetermined surface, from the predetermined surface side.

2/46. An apparatus according to Claim 45, further comprising a container for accommodating said at least one optical element within a space being isolated from a surrounding ambience.

3/47. An apparatus according to Claim 46, further comprising a cover, disposed at the predetermined surface side of said container, for suppressing diffusion of the gas supplied by said gas supplying means to the one optical surface closest to the predetermined surface.

4/48. An apparatus according to Claim 47, wherein said gas supplying means includes a plurality of gas supplying ports provided inside said cover and disposed revolutionally symmetrically with respect to an optical axis of said projection optical system.

5/49. An apparatus according to Claim 45, further comprising adjusting means for adjusting a gas supplying flow rate and a gas supplying pressure in accordance with the state of use of said exposure apparatus.

6/50. An apparatus according to Claim 45, further comprising temperature adjusting means for adjusting a temperature of the gas supplied from said gas supplying means.

7 / 51. An apparatus according to Claim 50, wherein said gas supplying means includes a plurality of gas supplying ports provided inside said cover and disposed revolutionally symmetrically with respect to an optical axis of said projection optical system.

8 / 52. A device manufacturing method, comprising the steps of:
exposing a workpiece with a pattern by use of an exposure apparatus as recited in Claim 45; and
developing the exposed workpiece.

53. An exposure apparatus for illuminating a pattern with light from a light source and for exposing a predetermined surface with light from the pattern, said apparatus comprising:
a projection optical system for projecting the pattern onto the predetermined surface, said projection optical system having at least one optical element having optical surfaces; and
gas supplying means for locally supplying a gas to said at least one optical element, wherein said gas supplying means directly blows the gas toward one of the optical surfaces of said at least one optical element, which is closest to the pattern, from the pattern side.

54. An apparatus according to Claim 53, further comprising a container for accommodating said at least one optical element within a space being isolated from a surrounding ambience.

55. An apparatus according to Claim 54, further comprising a cover, disposed at the pattern side of said container, for suppressing diffusion of the gas supplied by said gas supplying means to the one optical surface closest to the pattern.

56. An apparatus according to Claim 55, wherein said gas supplying means includes a plurality of gas supplying ports provided inside said cover and disposed revolutionally symmetrically with respect to an optical axis of said projection optical system.

57. An apparatus according to Claim 53, further comprising adjusting means for adjusting a gas supplying flow rate and a gas supplying pressure in accordance with the state of use of said exposure apparatus.

58. An exposure apparatus according to Claim 53, further comprising temperature adjusting means for adjusting a temperature of the gas to be supplied from said gas supplying means.

59. An apparatus according to Claim 53, wherein said gas supplying means includes a plurality of gas supplying ports provided inside said cover and disposed revolutionally symmetrically with respect to an optical axis of said projection optical system.

60. A device manufacturing method, comprising the steps of:
exposing a workpiece with a pattern by use of an exposure apparatus as recited in
Claim 53; and
developing the exposed workpiece.

61. An exposure apparatus for illuminating a pattern with light from a light source
and for exposing a predetermined surface with light from the pattern, said apparatus comprising:
a projection optical system for projecting the pattern onto the predetermined
surface, said projection optical system having at least one optical element having optical
surfaces; and
gas supplying means for locally supplying a gas to said at least one optical
element, wherein said gas supplying means produces a laminar gas flow between the
predetermined surface and one of the optical surfaces of said at least one optical element, which
is closest to the predetermined surface.

62. An apparatus according to Claim 61, further comprising a container for
accommodating said at least one optical element within a space being isolated from a
surrounding ambience.

63. An apparatus according to Claim 61, wherein said gas supplying means includes a
plurality of gas supplying ports disposed in a direction substantially perpendicular to a gas

supplying direction by said gas supplying means and also to an optical axis of said projection optical system.

64. An apparatus according to Claim 61, further comprising a cover for suppressing diffusion of the gas supplied by said gas supplying means to be between the predetermined surface and the one optical surface closest to the predetermined surface.

65. An apparatus according to Claim 61, further comprising adjusting means for adjusting a gas supplying flow rate and a gas supplying pressure in accordance with the state of use of said exposure apparatus.

66. An apparatus according to Claim 61, further comprising temperature adjusting means for adjusting a temperature of the gas supplied from said gas supplying means.

67. An apparatus according to Claim 63, further comprising a container for accommodating said at least one optical element inside a space being isolated from a surrounding ambience, and a cover disposed at the predetermined surface side of said container, for covering a portion around an optical axis of said projection optical system, wherein said plurality of gas supplying ports are disposed inside said cover.

68. A device manufacturing method, comprising the steps of:

exposing a workpiece with a pattern by use of an exposure apparatus as recited in Claim 61; and
developing the exposed workpiece.

69. An exposure apparatus for illuminating a pattern with light from a light source and for exposing a predetermined surface with light from the pattern, said apparatus comprising:

a projection optical system for projecting the pattern onto the predetermined surface, said projection optical system having at least one optical element having optical surfaces; and

gas supplying means for locally supplying a gas to said at least one optical element, wherein said gas supplying means produces a laminar gas flow between the pattern and one of the optical surfaces of said at least one optical element, which is closest to the pattern.

70. An apparatus according to Claim 69, further comprising a container for accommodating said at least one optical element within a space being isolated from a surrounding ambience.

71. An apparatus according to Claim 69, wherein said gas supplying means includes a plurality of gas supplying ports disposed in a direction substantially perpendicular to a gas

supplying direction by said gas supplying means and also to an optical axis of said projection optical system.

72. An apparatus according to Claim 69, further comprising a cover for suppressing diffusion of the gas supplied by said gas supplying means to between the pattern and the one optical surface closest to the pattern.

73. An apparatus according to Claim 69, further comprising adjusting means for adjusting a gas supplying flow rate and a gas supplying pressure in accordance with the state of use of said exposure apparatus.

74. An apparatus according to Claim 69, further comprising temperature adjusting means for adjusting a temperature of the gas to be supplied from said gas supplying means.

75. An apparatus according to Claim 71, further comprising a container for accommodating said at least one optical element inside a space being isolated from a surrounding ambience, and a cover disposed at the predetermined surface side of said container, for covering a portion around an optical axis of said projection optical system, wherein said plurality of gas supplying ports are disposed inside said cover.